Exploring the Both-And Success Paradox in Mega Construction Projects: Multi-Dimensional Assessments of Paradoxical Leadership, Project Agility and Mega-Project Success

Abstract

Purpose

Organizations are full of contradictions and leadership dilemmas. Managers often face challenges such as selecting between two contradicting options such that which one is more important can hardly be judged. To manage contradicting dynamics, today's managers can adopt the paradoxical leadership approach. We build a theoretical model to investigate the influence of paradoxical leadership on multi-dimensional project agility (proactivity, adaptability, and resilience), and multi-dimensional project success (management, investment, and ownership success).

Methodology

Drawing on survey-based data from the China-Pakistan Economic Corridor (CPEC) megaproject (N=209), we performed covariance-based structural equation modeling to test the conceptual model.

Findings

The findings show that a) paradoxical leadership has a significant positive impact on megaproject success, b) paradoxical leadership has a significant positive influence on project agility, c) project agility has a significant positive effect on megaproject success, and d) project agility has a significant effect that mediates the link between paradoxical leadership and megaproject success. This research provides a theoretical and practical comprehension of paradoxical leadership with a new perspective on megaprojects.

Originality/value

This study provides an extension of the existing studies on paradoxical leadership and identifies the role of contradicting dynamics and their impact on multiple facets of megaproject success. It not only clarifies the relationship between paradoxical leadership and megaproject success, but also identifies the mediating role of project agility that can play an effective role in mobilizing success in megaprojects.

Keywords: Paradoxical leadership, project agility, megaproject success, satisficing theory, program's theory of change.

1. Introduction

Paradoxical leadership in mega-construction projects can be instrumental in managing conflicting priorities while balancing short-term and long-term goals simultaneously (Mashali et al., 2023; Shehata et al., 2023; Zhang, Zhang & Law, 2022). As the desire to reconcile the competing demands of megaproject stakeholders becomes increasingly challenging, paradoxical leadership promises to achieve multi-stakeholders' interests and objectives (Shehata et al., 2023; Zaman et al., 2022). Owing to the complexity and competition in business environments, upper-level management and leaders require a more versatile leadership style that can be productive in handling pressure (Kundi, Aboramadan & Abualigah, 2023; Salvoldi et al., 2022). It has long been understood that using a paradoxical and counterintuitive perspective to manage organizations is at the essence of leadership in modern environments (Kundi, Aboramadan & Abualigah, 2023; Salvoldi et al., 2022; Zhang et al., 2015). Along with

many other roles of management, leaders ultimately encounter contradictions and need to resolve conflicts (Salvoldi et al., 2022; Shehata et al., 2023). Contingency theories, such as that by Smith and Lewis (2011), suggest that adopting a mixed strategy depending on the situation, an "either/or", is the best approach to handle paradoxes where a leader needs to select one option between two contradicting yet equally important alternatives (Kundi, Aboramadan & Abualigah, 2023; Salvoldi et al., 2022). For instance, in a megaproject, the team leader may face a situation where there is a need to prioritize any one of the project scope, time, or budget (Samset and Volden, 2016; Shehata et al., 2023; Zaman et al., 2022). Another fundamental paradox arises when a leader needs to choose between exerting control on the team by taking the lead or encouraging other team members to grow leadership skills by offering them to lead (Kundi, Aboramadan & Abualigah, 2023; Stewart et al., 2019). In such organizational dynamics, leaders need to adopt a "both-and" leadership strategy in which the decision-making supports both alternatives by adopting a balanced-approach between both contradictions (Salvoldi et al., 2022; Shehata et al., 2023). These contradicting responses to organizational change and its adoption can bring organizational tensions and conflicts in management routines (Kundi, Aboramadan & Abualigah, 2023). When these situational paradoxes in organization environments arise, they can be handled effectively with paradoxical leadership skills (Kundi, Aboramadan & Abualigah, 2023; Stewart et al., 2019; Waldman and Bowen, 2016).

Paradoxical leadership is defined as a style where the leader considers the needs of all the sides in an organization and adopts a behavior that simultaneously incorporates contradicting alternatives and options into decision-making to meet the desired objectives (Kundi, Aboramadan & Abualigah, 2023; Zhang et al. 2015). This style of meeting and integrating competing demands simultaneously over time is the most effective way to lead diverse teams and achieve innovative goals (Salvoldi et al., 2022). However, the focus of the project management literature, and most specifically on construction management, has been on other leadership approaches (Zaman et al., 2022). For instance, transformational leadership has been the prime focus of researchers (Chan, 2020; Zaman et al., 2020). Similarly, functional leadership has been studied as an effective approach to managing diverse teams (Homan et al., 2020). In contrast, some studies have presented a comprehensive analysis of coercive, pacesetting, democratic, affiliative, authoritative and coaching leadership styles in project management (Novo et al., 2017; Thoha and Avandana, 2020). Paradoxical leadership is still under-presented in project management literature and there is a lack of empirical evidence on the nature and implications of paradoxical leadership in megaprojects (Kundi, Aboramadan & Abualigah, 2023; Shehata et al., 2023; Zaman et al., 2022).

Along with leadership style and competence, there are numerous elements that act as a determinant of the fate of a project (Ma & Fu, 2020; Mashali et al., 2023). Many times, sudden changes and modifications in project plans

cause inconsistency in project management, which also results in ambiguity in meeting project objectives (Kanski, Budzynska & Chadam, 2023; Mashali et al., 2023; Zaman et al., 2022). These uncertainties can be best tackled with project agility (Kanski, Budzynska & Chadam, 2023; Pyne, 2022) which is the tendency of a project to adopt sudden amendments in project planning as a response to budget, time and/or scope constraints (Conforto et al., 2016; Radhakrishnan et al., 2022). It is an encompassing concept of resilience, adaptability, and proactivity within project plans and the management team (Kanski, Budzynska & Chadam, 2023). Project agility can have consequential effects on the success of megaprojects (Kanski, Budzynska & Chadam, 2023; Zaman et al., 2022). As a multi-dimensional measure, all three tenets (i.e., project proactivity, project adaptability and project resilience) are equally important to create a holistic projection of project agility (Cai et al., 2018; Pitafi et al., 2018; Kanski, Budzynska & Chadam, 2023; Mashali et al., 2023). In the case of megaprojects, the sensitivity of success toward project agility increases due to heightened scope, time, and budget (Radhakrishnan et al., 2022; Zaman et al., 2021).

The present study focuses on all three dimensions of project agility (i.e., project proactivity, project adaptability and project resilience) to study its mediating connection with paradoxical leadership and megaproject success, which have been rarely examined (Kundi, Aboramadan & Abualigah, 2023; Radhakrishnan et al., 2022; Mashali et al., 2023; Zaman et al., 2022). Conventionally, megaproject success has been studied as an all-inclusive concept of budget, time, and scope satisfaction, specifically in the construction industry (Narayanan et al., 2011; Zaman et al., 2022). However, modern, and complex project and management systems need researchers to evaluate megaproject success with additional measures taken from the perspective of owners, management teams, investors, and sponsors (Ma & Fu, 2020; Mashali et al., 2023; Zwikael and Meredith, 2021). We adapted a multi-dimensional measure of megaproject success incorporating management, investment, and ownership success. The inclusion of additional dimensions within these measures satisfies the different perspectives of megaproject success for the management team, investors, and owners (Ma & Fu, 2020; Mashali et al., 2023; Zaman et al., 2022).

The increased complexity of internal and external environments of megaprojects (Ma & Fu, 2020; Mashali et al., 2023), the emergence of multiple paradoxes (Samset and Volden, 2016; Shehata et al., 2023), and the active role of understudied parameters in megaproject success (Ma & Fu, 2020; Mashali et al., 2023) has unlocked new directions in project management research (Mashali et al., 2023; Zaman et al., 2022). Moreover, a critical knowledge gap in terms of limited research on paradoxical leadership in megaprojects (Salvoldi et al., 2022; Shehata et al., 2023; Mashali et al., 2023; Zaman et al., 2022) necessitates exploration of different facets of “both-

and" approach (Mashali et al., 2023; Shehata et al., 2023). Owing to the significance of paradoxical leadership and project agility to deliver successful outcomes in megaprojects, the present study aimed to investigate these underlying relationships within the context of the China-Pakistan Economic Corridor (i.e., multi-billion-dollar megaproject) (Mashali et al., 2023; Radhakrishnan et al., 2022; Shehata et al., 2023; Zaman et al., 2022). The present study has been structured as follows: Section 1 presents background knowledge, introduction and rationale of the study, Section 2 presents hypotheses of the study along with supporting theoretical background. Section 3 elaborates on the methodology by highlighting the sampling technique and data collection procedure using well-established adapted scales, while Section 4 presents outcomes of the statistical analysis and estimation of the hypotheses testing outcomes. Finally, a discussion of the study findings (in contrast to prior literature), implications, limitations, opportunities for future research and study's conclusion are presented in Section 5.

2 Literature Review

2.1. Paradoxical Leadership (PL)

The notion of paradoxical leadership is that the leader uses "both-and" techniques to embrace and assimilate opposing demands or seemingly contradicting alternatives throughout time in order to leverage the paradox goal (Kundi, Aboramadan & Abualigah, 2023; Waldman and Bowen, 2016). Zhang et al. (2015) were among the pioneers in introducing the idea of paradoxical leadership, which they described as two opposing yet interrelated options or behaviors that need to be simultaneously managed to achieve the required outputs (Zhang et al., 2015; Shehata et al., 2023). In their study, Zhang et al. (2015) developed a scale to assess the multi-dimensional nature of paradoxical leadership. Five dimensions of counterintuitive and paradoxical leadership approaches were endorsed, including dimensions related to problems involving conflicts between the leader and others (Zhang, Zhang & Law, 2022; Zhang et al., 2015). The dimensions are as follows (1) addressing team members uniformly whereas acknowledging that every member anticipates being comprehended and regarded as an individual entity; (2) implementing the requisite criteria of task necessities while acknowledging that flexibility should prevail; (3) keeping definitive decision authority yet providing subordinates autonomy to enable them to feel connected via their acknowledged accomplishments; (4) retaining decision authority yet promoting autonomous work environment; and (5) imposing job standards whilst staying flexible (Kundi, Aboramadan & Abualigah, 2023; Zhang et al., 2015).

In another study, Samset and Volden (2016) highlighted ten paradoxes based on counter-intuitive outcomes that mainly emerged in the governance and management of megaprojects. In their study, they discussed case studies

of some major projects to depict how these paradoxes can be handled by adopting the "both-and" approach. The study adds to the literary evidence that supports the efficacy and usefulness of paradoxical leadership in such situations. In a recent study, Franken et al. (2020) found theoretical and empirical support for paradoxical leadership to foster resilience in project management teams. The authors argued that the capabilities of leaders in managing organizational and situational paradoxes nurture resilience in project teams as well as the project itself. Also, it was further stated that having paradoxical leadership abilities is obligatory for project leaders and managers due to the complex dynamics of the project and organizational environments. Alfes and Langner (2017) also studied paradoxical leadership and found that leaders that effectively manage the tensions between directive and participative leadership can promote a volunteering work environment within the team. The authors discussed that paradoxical leaders that practice participative leadership without losing control and authority encourage their subordinates to participate and volunteer in project tasks, thus adding to the chances of project success. Similarly, reliable research evidence can be found that supports paradoxical leadership as a promoter of innovation and creativity (Li et al., 2018), positive attitude and behaviors related to work (Li et al., 2020), and employee voice behavior (Xue et al., 2020).

Exploring deeper into the context of leadership in paradoxes, Pearce et al. (2019) argued that situational and paradoxical approaches to leadership can be the forerunners of meta-paradoxical leadership. Moreover, the authors emphasized that paradoxical leaders grow increasingly competent in coping with organizational challenges and paradoxes related to managing short and long objectives simultaneously by becoming circumstantially aware and participating in meta-paradoxical leadership (Salvoldi et al., 2022; Shehata et al., 2023). Paradox leadership can be best explained from the theoretical lens of paradox management theory or simply named the theory of paradox by Smith and Lewis (2011). This theory establishes that the outcomes of two contradicting possibilities or options can be managed to achieve a balanced outcome that constitutes the gains of both possibilities (Shehata et al., 2023). Actors and agents within a system, i.e., project management, need to develop a dynamic approach to achieve paradoxical leadership (Ma & Fu, 2020; Shehata et al., 2023; Zhang, Zhang & Law, 2022).

2.2. Project Agility (PA)

Project agility is defined as the capability of the management team and all the stakeholders to put in place a project plan to respond to any event before it poses adverse impacts to the project or its outcomes (Baweja & Venugopalan, 2015; Kanski, Budzynska & Chadam, 2023; Radhakrishnan et al., 2022). However, we have defined project agility from a multi-dimensional perspective as the ability of a project or a project team to respond

to sudden changes in project management, time, cost and/or scope without disturbing the end goals or risking project success (Kanski, Budzynska & Chadam, 2023). The multi-dimensionality of project agility has been addressed by different researchers (Radhakrishnan et al., 2021; Rahi, 2019). Project agility, being a multi-dimensional concept, encompasses three main facets of agile projects (i.e., project proactivity, adaptability, and resilience). Project proactivity is regarded as the ability of a project and management team to cope with sudden changes in plans even before they happen. Project adaptability is the measure of flexibility within project plans to cope with changes and amendments without disrupting the pre-set project objectives (Baweja and Venugopalan, 2015, p. 06). Project resilience remains novel, highly ambiguous and unclear, despite gaining acknowledgment in the scholarly literature (Thomé et al., 2016; Pyne, 2022; Radhakrishnan et al., 2022).

Geambasu (2011) is among the pioneers who spearheaded the idea of project resilience. The author defined the term project resilience as "*the ability of a project to adapt to sudden changes in the project plan and to keep on meeting its short-term targets in spite of being subjected to adverse and critical events*" (Geambasu, 2011, p.133). Another understanding of project resilience was provided by Turner and Kutsch (2015). The authors described project resilience as the skill of recognizing shifts in the project milieu, comprehending these shifts, formulating responses, limiting harm whenever a disruption happens, and adjusting to a newer environment. Blay (2017) performed experimental research to better understand project resilience. As a result, the author describes this notion as the ability to react to, plan for, and mitigate the consequences of disturbances to recuperate and complete project goals successfully. Proactivity, coping capacity, adaptability, and perseverance are the four elements of the theoretical model for project resilience. The concept of project agility finds theoretical support from the program theory of change (Weiss, 1995), which motivates systems, managers, and organizations to embrace and adapt to changes in project plans with the help of active planning, participation, and decision-making. Wufka and Ralph (2015) also used the process theory of change to explain agility in management. Moreover, from the lens of the theory of constraints (Goldratt, 1990), any system (i.e., a construction project in our study) can fail to achieve one or more of its goals due to certain constraints. This theory helps in identifying such constraints that can potentially cause project failures, such as budget, resource, or time constraints. Proper implementation of this theoretical concept can add to the agility of the project, as it will help in identifying any events before they negatively impact project success (Kanski, Budzynska & Chadam, 2023; Mashali et al., 2023).

2.3. Megaproject Success (MPS)

Megaproject success, specifically in the construction sector, is evaluated on the grounds of satisfying budget, time, and scope constraints (Ma & Fu, 2020; Mashali et al., 2023; Wang et al., 2019). The "project management body

of knowledge" (PMBOK) established that the success of any megaproject could be measured in terms of three basic tenets of its completion (i.e., within scope and budget as well as on-time project completion) (Tavan and Hosseini, 2016). Several floundering issues affect megaprojects, including schedule overrun, budget transgression, and substandard project quality (Ma & Fu, 2020; Mashali et al., 2023; Flyvbjerg et al., 2003). Likewise, Giezen (2012) suggested that megaprojects frequently have severe budget and schedule shortfalls that jeopardize megaproject success. As a result, a high level of competence and performance is a crucial requirement for success. However, due to substantial growth in scope and stakeholders, megaproject success has emerged as a wider notion and the criteria for evaluating success can change from one project to another (Müller and Turner, 2007). Therefore, recent studies have proposed that there should be some additional measures of megaproject success, as the "basic triangle" is not comprehensive to satisfy the projection of success from the investor's, sponsor's, owner's, and management team's perspectives (Wang et al., 2019). In this study, a multi-dimensional measure, including megaproject management success (MMS), megaproject investment success (MIS), and megaproject ownership success (MOS), has been used to assess the success of a megaproject. The inclusion of additional constructs satisfies the projection of success from the perspective of the project management team, investors and owners, along with the basic essence of budget, time and scope. Shenhar et al. (2001) studied project success as a multi-dimensional concept. The authors found reliable evidence for four distinctive dimensions of success, including (1) efficiency of a project, (2) project's influence on the customers, (3) success from organization and business perspective, and (4) future perspectives of the project. However, the authors also mentioned that identified dimensions of success could change according to the time and situation and new dimensions could emerge as well on a project-to-project basis (Ma & Fu, 2020; Mashali et al., 2023).

Owing to the important role of the management team and strategy in the success of any project. Munns and Bjeirmi (1996) considered project management as a foremost indicator of project success. Moreover, Mir and Pinnington (2014) also found satisfactory evidence of the positive association between project management and project success, implying that megaproject management is a major dimension of megaproject success. In their study, Papke-Shields et al. (2010) established a positive relation between project management practices and megaproject success. Similarly, Albeshr (2019) conducted a study focused on identifying the determinants of the success of megaprojects. The author concluded that project management strategies and practices significantly affected the success of megaprojects. MPS assesses the accomplishment of a megaproject in terms of its plan (i.e., scope, budget, schedule, and quality goals), but the other two dimensions (i.e., MIS and MOS) represent megaproject accomplishment as well as success from the business and value generation point of view (Zwikael and Meredith,

2021). However, MIS is the measure of monetary returns or gains to its investors irrespective of project goal achievement. Whereas MOS serves as a measure of the accomplishment of business and organization-related targets (Martinsuo et al., 2019). While MMS only related to the success of the project manager and management team in meeting project planning goals. The three tenets of megaproject success are comprehensively discussed and used by earlier studies (Zwikael and Meredith, 2021; Zwikael and Smyrk, 2012). Simon's (2013) theory of satisficing managerial behavior provides conceptual support for megaproject success. This theory argues that project managers are more inclined to satisfice their pre-set aims and objectives instead of maximizing them. This theory has been applied to different contexts (Goh and Hall, 2013) of project management after its success. Zwikael and Smyrk (2012) also employed this theory and stated that if a project does not succeed in satisfying its business case objectives, it might not be considered as project failure as it may succeed in terms of the manager's, owner's or investor's perspective despite failing in others (Mashali et al., 2023; Zaman et al., 2022).

2.4. Research Gap and Hypotheses Development

2.4.1. *Paradoxical Leadership and Megaproject Success*

The unstructured and autocratic leadership style in project management is the optimum model for dealing with highly dynamic environments with substantial unpredictability and turbulence (Tidd and Bessant, 2014). This capability of the project management team not only exterminates the adverse effects of multi-modal circumstances but maximizes the gain from each of its possibilities, thus contributing more toward success (Zaman et al., 2021). Furthermore, according to Dougherty (2001), a project's flexibility and capacity to react to the changing environments require a high degree of informational exchange, decentralization, and minimal formalities in project management. In the construction industry, which has the maximum level of enterprise environmental destabilization and variability (Salo, 2017), the paradoxical leadership approach for project management might be expected to outperform other centralized and strict project management methodologies (Herron and Garland, 2019; Shipman and Tooey, 2017). In construction, project leaders must create an atmosphere wherein management teams are motivated and encouraged to execute decisions in a complicated and adaptable environment, as this will boost engagement and project success (Ma & Fu, 2020). According to de Waal (2007), high-performance organizations must encourage cross-functional cooperation, simplify the organization to reduce complexity and intricacy and expedite knowledge and information transfer. The paradoxical theory proposed by Smith and Lewis (2011) and the stewardship theory of management (Davis and Donaldson, 1997) combinedly provides theoretical support for this hypothesized relation as paradoxical theory argues that the dynamically

balanced approach of agents and actors in a system contributes toward paradoxical leadership, while stewardship theory sees these agents as stewards acting for achieving the goals of their principal (i.e., a manager, investor or an owner). By combining these two theories, a direct relationship between paradoxical leadership and megaproject success can be hypothetically formed (Kundi, Aboramadan & Abualigah, 2023; Mashali et al., 2023; Zaman et al., 2022). A manager's balanced approach towards a dynamic environment is called paradoxical leadership and the same manager is considered as a steward who acts to accomplish the goals set by the investor or owner. This indicates that the balanced approach (referred to as paradoxical leadership) is also an act toward the success of a megaproject (Salvoldi et al., 2022; Shehata et al., 2023; Mashali et al., 2023; Zaman et al., 2022). It is quite feasible to hypothesize the linkage between paradoxical leadership and megaproject success:

H_1: Paradoxical leader has a significant positive effect on megaproject success.

2.4.2. Paradoxical Leadership and Project Agility

A balanced management approach between the two faces of a paradox not only contributes to megaproject success by maximizing the gain from both possibilities but also adds to the agility of the project by diminishing their adverse effects (Conforto et al., 2016; Kanski, Budzynska & Chadam, 2023). Thus, debilitated events and threats can be easily tackled by the management team, showcasing their agility without causing any serious risk to project success. Such instances train the management team to deal with situations and risks of adverse consequences, making them capable of responding quickly to changes and unanticipated incidences (Ma & Fu, 2020; Salvoldi et al., 2022). Moreover, managers can express the conflicts in their workplace and demonstrate how to handle them. Leaders may affect followers' conduct via interpersonal training by imitating actions that are noticed, copied, and associated with (Brown et al., 2005). Followers may develop crucial abilities for dealing with paradoxes and project agility problems via these activities. Effective managers, counterintuitively, foster these qualities in their teams by making adaptable decisions and explaining the logic underlying such actions to subordinates (Waldman and Bowen, 2016). Furthermore, their adaptability allows for contextual understanding and innovative problem-solving; both of these are beneficial to project agility, specifically project resilience (Waldman and Bowen, 2016). Dispute resolution is also a part of paradoxical leadership talents since they proactively uncover conflicts and find innovative resolutions (Smith and Lewis, 2011). Handling contradictions, like those involving organizational and interpersonal expectations, would also promote work settings where employees know "*exactly what to accomplish and how to do it*" (Zhang et al., 2015). In such situations, paradoxical leaders utilize their power to maintain greater job standards while allowing employees to leverage their particular skills and competencies, as well as judgment and persuasion to attain career and individual objectives (Franken et al., 2020; Zhang, Zhang & Law,

2022). These situations, when paired with observational interactions, offer the standards, opportunities, and methods for resilient and agile behaviors of project management teams as well as agility within projects (Salvoldi et al., 2022; Zaman et al., 2022). Addressing the conflicting needs of operational agility successfully is a concern for executives. Structured procedures allow for controlled resource allocations, but quick-thinking and decisive actions assist leaders in anticipating transformation (Radhakrishnan et al., 2022; Salvoldi et al., 2022; Zaman et al., 2022). Each component on its own may be harmful. Excess planning process may lead to lethargy, as comparative gains grow ingrained, and flexibility is hampered (Kanski, Budzynska & Chadam, 2023; Radhakrishnan et al., 2022; Shehata et al., 2023). Similarly, a singular focus on transformation may stymie the formation of essential talents that serve as the basis for adaptation and learning. Leaders must be able to detect and address these conflicts (Alfes and Langner, 2017). According to paradoxical leadership theory (Pyne, 2022; Radhakrishnan et al., 2022), such contradictions produce uncertainty and ambiguity, which may lead to stress and dismissiveness (Kanski, Budzynska & Chadam, 2023; Smith and Lewis, 2011). Hence, the second hypothesis is framed as:

H_2: Paradoxical leadership has a significant positive effect on project agility.

2.4.3. *Project Agility and Megaproject Success*

The competence to successfully adjust to variations in project demands is a key feature that distinguishes a top-performing project management team from an average team (Lee and Xia, 2005; Radhakrishnan et al., 2022). Agile methodologies make it easier to respond quickly to changes (Conboy, 2009), which results in elevated-quality project solutions (Maruping et al., 2009; Pyne, 2022). Project modifications might only need a small number of extra resources. When adaptability is significant, the time and expense of dealing with need modifications are also reduced. Consequently, increasing project agility will lead to "on-time project completion" and "within-budget project completion". Furthermore, an agile project management team would effectively meet the demands of stakeholders (Mashali et al., 2023; Radhakrishnan et al., 2022).

Prior to beginning an agile program, stakeholders often specify key requirements (designs, functionality, and productivity) (Dingsøyr et al., 2012). As a result, obtaining greater rates of project agility aids in satisfying these requirements. Customers, funders, and project management team members rate projects more favorably when they are agile since stakeholders are pleased with the results. Thus, increased project agility enhances all three dimensions of megaproject success, according to Dingsøyr et al. (2012). Contrastingly, according to Niederman et al. (2018), the connection of project agility with project success is indeed not simple but rather a labyrinth of

contextual linkages. It is still a blank space, according to Niederman et al. (2018). When evaluating project management team results, organizational research evidence suggests that flexible behavior plays a mediating function. However, there hasn't been any significant research on this topic in the research on agile projects (Kanski, Budzynska & Chadam, 2023; Pyne, 2022; Radhakrishnan et al., 2022).

The multifaceted functions of the project management team in an agile megaproject scenario can be conceptualized through the "Complex Adaptive Systems" (CAS) theory. In management and administrative research and information and project management research, some scholars have utilized the ideas and concepts of CAS theory (Jain and Meso, 2004; Nan, 2011; Sweetman and Conboy, 2018). We use Holland's (1992) description of a Complex Adaptive System (CAS) as a "system comprised of interactive entities expressed in the context of rules. As experience accumulates, the agents adapt by modifying their rules" (Holland, 1992, p. 10). The CAS theory is made up of three parts: agents, interactions, and the environment (Nan, 2011). The behavior of components and the environment of the system does not necessarily govern the agent's decision-making and interactions between the three pillars of a complex system. This implies that when the agent's choices are not being heavily affected by the environment of the system (changes in project plans in this case), they are in a better position to withstand these behaviors, thus contributing to project success (Mashali et al., 2023; Radhakrishnan et al., 2022; Zaman et al., 2022). Dooley's (1997) modification of this model also advocates for this organizational change and adaptive system relationship (Kanski, Budzynska & Chadam, 2023; Zaman et al., 2022). Hence, the third hypothesis is framed as:

H_3: Project agility has a significant positive effect on the megaproject success.

2.4.4. *Mediating effect of Project Agility*

As proposed by CAS (Holland, 1992), the adaptive and agile agents enhance the performance of a complex system to generate better results (Kanski, Budzynska & Chadam, 2023; Pyne, 2022). Although the role of project agility as a mediator is understudied in project management literature from the theoretical concept of CAS, project agility (being an adaptive agent) would mediate megaproject success under the direct or indirect effect of paradoxical leadership (Kanski, Budzynska & Chadam, 2023; Zaman et al., 2022). According to Sweetman and Conboy (2018), the adaptive agents of CAS (project agility in this case) need to be readily acceptable to changes and transformation; otherwise, their impact on the environment/system fades quickly. The significant positive effect of paradoxical leadership on megaproject success is theoretically arbitrated by project agility (Kanski, Budzynska & Chadam, 2023; Shehata et al., 2023; Zaman et al., 2022). The role of paradoxical leadership in balancing the

adverse outcomes of contradicting possibilities depends on the agility of the management team (Radhakrishnan et al., 2022). Given the circumstances, if the management team is unable to withstand minor risk events, filtered out of bigger threats with the help of "both-and" leadership, then a paradoxical leadership approach would not foster megaproject success (Ma & Fu, 2020; Zhang, Zhang & Law, 2022). Similarly, if the management team can respond quicker than anticipated and withstand higher uncertainties, then paradoxical leadership will have an exponentially positive effect on megaproject success (Lewis et al., 2014; Mashali et al., 2023; Shehata et al., 2023; Zaman et al., 2022). Therefore, project agility plays the role of a mediator between paradoxical leadership and megaproject success (Kundi, Aboramadan & Abualigah, 2023; Radhakrishnan et al., 2022; Mashali et al., 2023; Zaman et al., 2022). Thus, the hypothesized relationship can be framed as H_4.

H4: Project agility significantly mediates the relationship between paradoxical leadership and megaproject success.

As a potential antecedent of megaproject success, the mediating effects of project agility have been rarely examined in prior literature (Kanski, Budzynska & Chadam, 2023; Ma & Fu, 2020; Mashali et al., 2023; Radhakrishnan et al., 2022; Zaman et al., 2022). Hence, the present study has pioneered in conceptualizing a model of paradoxical leadership and megaproject success that aims to fill this critical knowledge gap by employing project agility (including project proactivity, project adaptability and project resilience) as a mediating construct (Kanski, Budzynska & Chadam, 2023; Kundi, Aboramadan & Abualigah, 2023; Radhakrishnan et al., 2022; Ma & Fu, 2020; Zaman et al., 2022). Figure 1 provides the summary of hypotheses in the form of a conceptual model where the underlying connections between paradoxical leadership, project agility and megaproject success are presented.

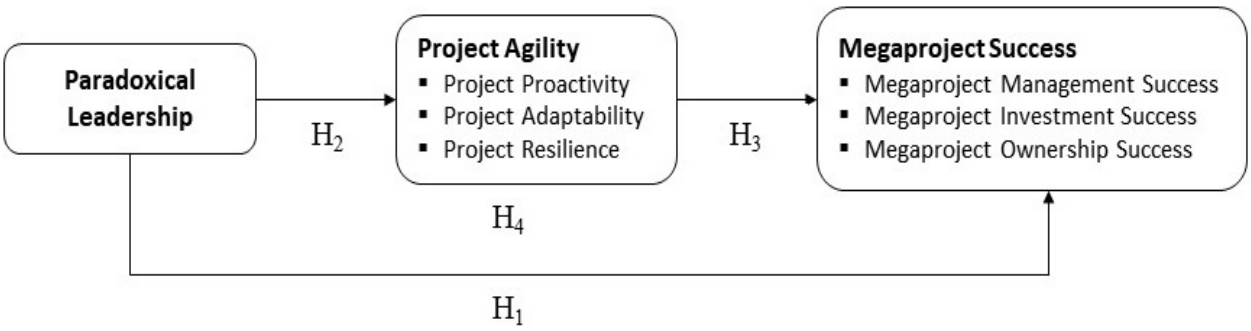

Figure 1 Conceptual Model of Megaproject Success

(Source: Authors own work)

3. Methodology

3.1. *Sampling and Procedure*

The present study empirically examined the hypothesized relationships between paradoxical leadership, project agility and megaproject success using covariance-based structural equation modeling (CB-SEM) for hypotheses testing, as well as estimation for multi-collinearity and discriminant validity. The research population of the present study included project officials and practitioners associated with the China-Pakistan Economic Corridor (CPEC) megaproject (a construction and infrastructure megaproject under the joint venture of Pakistan and Chinese government), from which a research sample (N=209) of volunteer participants was extracted. A combination of sources was used to collect primary data from CPEC officials, i.e., through e-mails (sharing online research questionnaires), social media platforms (e.g., LinkedIn, WhatsApp, and Facebook), and fewer face-to-face interactions under safety protocols of the COVID-19 pandemic (Zaman et al., 2022).

Most of the CPEC officials were accessed through publicly available information and e-mail addresses on CPEC-related project websites. As the availability of information played a decisive role in the selection of research participants, the sampling was primarily based on the researcher's judgmental approach. Moreover, a combination of judgmental sampling and snowballing techniques was employed to search, access, and finalize the pool of volunteer CPEC representatives (Aktan et al., 2021; Zaman et al., 2022). As a procedural remedy to overcome common-method and/or response bias (as recommended by prominent studies), the respondents were clearly notified that: (1) responses were confidential; (2) respondents' anonymity was fully ensured; and (3) study data and findings were to be used for only academic purposes (Dillman, Smyth & Christian, 2014; Podsakoff, MacKenzie & Podsakoff, 2012; Zaman et al., 2023). Importantly, the respondents had no information about the conceptual model of the present research, which reduced the possibility of response bias. Also, the consistency of the respondents' responses ensured that they had truthfully expressed their beliefs while filling out the survey form (Podsakoff, MacKenzie & Podsakoff, 2012; Zaman et al., 2023). Moreover, the pretesting of the survey data and adapted measures through an initial pilot study with a smaller sample size (N=60) also helped to identify and remove any issues of response bias (Podsakoff, MacKenzie & Podsakoff, 2012; Podsakoff, MacKenzie, Lee & Podsakoff, 2003; Zaman et al., 2023). Prominent studies have recommended a minimum sample size (N>200) for the estimation of findings using the widely adopted covariance-based structural equation modeling (CB-SEM) technique (Hair et al., 2017; Kline, 2015; Muthén & Muthén, 2017; Nguyen, 2022; Zaman et al., 2021). Hence, the present study data (N=209) clearly met the sample size estimation requirements for CB-SEM (Kline, 2015; Muthén & Muthén, 2017; Nguyen, 2022; Zaman et al., 2021).

While the conceptual framework (visualized as Figure 1) represents the theoretical connections among the study's constructs, the flowchart diagram (visualized as Figure 2) outlines the entire research process, including data collection, statistical analysis, and procedural decision-making steps (Khan & Khan, 2022; Wang & Wang, 2023). The stepwise research method and procedures were adopted from prominent studies (Cho & Hadikusumo, 2023; Wang & Wang, 2023; Zaman et al., 2021), including; (1) *Quantitative and Deductive Research approach* to provide a solid foundation for the research process; (2) *Identification of Study Population* to set the boundaries for the research and ensuring a well-defined focus; (3) *Judgmental and Snowball Sampling procedure* to select the participants, ensuring representation and relevance; (4) *Data collection using Cross-Sectional Survey* to allow a comprehensive snapshot of the variables of interest at a specific point in time; (5) *Data Cleaning and Preparation* to enhance data quality and suitability for analysis; (6) *Pilot Testing* to identify and address any potential issues with data collection and survey instruments; (7) *Sample Size Selection* to balance statistical power and practical constraints; and (8) *Data Analysis using CB-SEM with Mplus* for robust and in-depth examination of the research hypotheses (Khan & Khan, 2022; Wang & Wang, 2023; Zaman at al., 2021). Hence, the robustness of the methodological framework was ensured through a systematic and thorough approach, maintaining rigor and reliability throughout the study (Cho & Hadikusumo, 2023; Khan & Khan, 2022; Wang & Wang, 2023; Zaman et al., 2021).

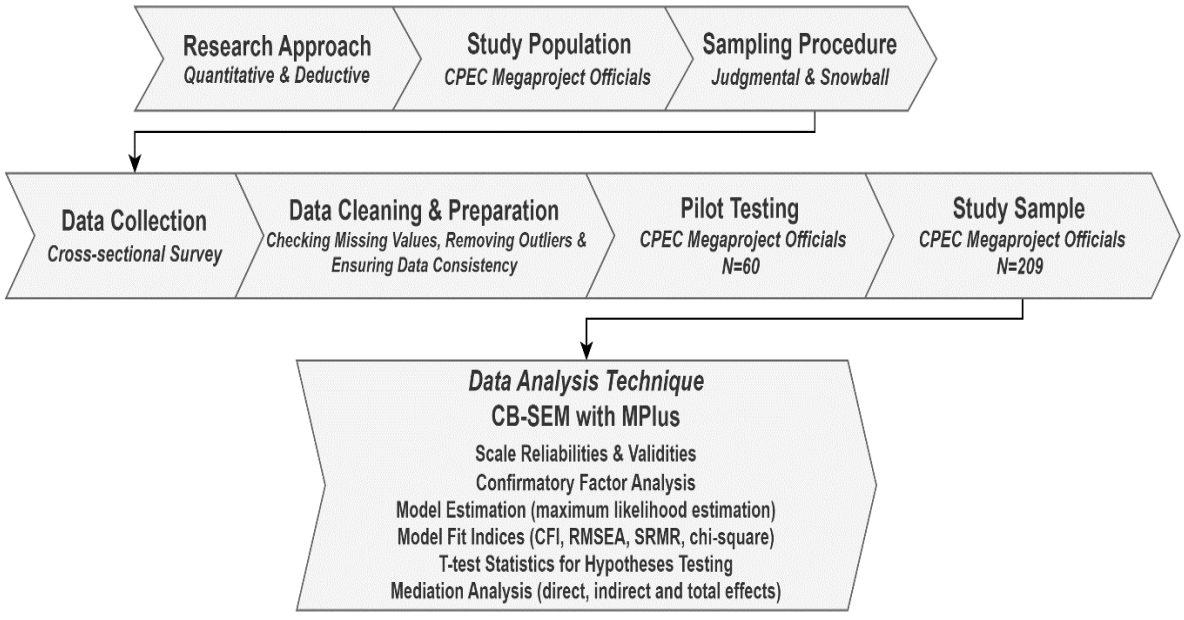

Figure 2 Stepwise Research Method and Procedure

(Source: Authors own work)

3.2. Measures

The present study employed adapted scales and followed the recommended procedures to ensure the robustness of the methods, including; (1) *Validity of adapted measures* (through content validity, expert review, pilot testing, and construct validity); and (2) *Reliability of adapted measures* (through test-retest reliability, internal consistency, and inter-rater reliability) (Cho & Hadikusumo, 2023; Novieto & Kportufe, 2022; Wang & Wang, 2023; Zaman at al., 2021). Importantly, the present study carefully selected the adapted measures that were chosen because of their clear alignment with the research objectives (Musawir et al., 2017; Zaman et al., 2021). The adapted measures were deemed appropriate as these have been extensively used in similar studies and have demonstrated their suitability for assessing the constructs of interest (Cai et al., 2018; Cho & Hadikusumo, 2023; Novieto & Kportufe, 2022; Pitafi et al., 2018; Wang & Wang, 2023; Zaman at al., 2021; Zhang et al., 2015). Furthermore, the modified version of these adapted measures specifically addressed the unique context and population under investigation (Musawir et al., 2017; Zaman et al., 2021). Furthermore, the SEM estimations with Mplus statistically verified the validity and reliabilities of all adapted measures in the specific context of the present study (Musawir et al., 2017; Muthén & Muthén, 2017; Zaman et al., 2021).

3.2.1. Paradoxical Leadership

A multi-dimensional scale comprising 22 items was adapted from Zhang et al. (2015) that measured paradoxical leadership with its five dimensions, including (1) treating uniformly and individualization (comprising five items); (2) self-centredness and other centredness (comprising five items); (3) decision control and autonomy (comprising four items); (4) enforcing work requirements and flexibility (comprising four items); and (5) maintaining distance and closeness (comprising five items). All adapted scale items were specifically designed to measure paradoxical leadership (including its five dimensions) in the context of mega-construction projects (Zaman et al., 2021; Zhang et al., 2015). All adapted items were designed on a 5-point Likert scale (1 being strongly disagree, and 5 being strongly agree).

3.2.2. Project Agility

To measure project agility, a 15-item multi-dimensional scale involving three dimensions (i.e., project proactivity, project adaptability and project resilience) was adapted from prominent studies (Cai et al., 2018; Pitafi et al., 2018). Project proactivity dimension was measured through five-items adapted from Cai et al. (2018). Likewise, the project adaptability dimension was measured through six-items also adapted from Cai et al. (2018). Lastly, the project resilience dimension was measured through four-items adapted from Pitafi et al. (2018). In order to ensure better internal reliability and validity of the research instrument, two items for project adaptability (i.e.,

PA10 and PA11) were deleted from the adapted scale due to lower factor loading values. All the items were designed on a 5-point Likert scale (1 being strongly disagree, and 5 being strongly agree).

3.2.3. Megaproject Success

Megaproject success was also measured through an adapted multi-dimensional scale comprising 11-items for measuring its three-dimensions, namely (1) megaproject management success, (2) megaproject ownership success and (3) megaproject investment success (Musawir et al., 2017; Zaman et al., 2021). To measure megaproject management success, five-items were adapted from Musawir et al. (2017). Likewise, three-items were adapted to measure megaproject ownership success and an additional three items were adapted to measure megaproject investment success (Musawir et al., 2017; Zaman et al., 2021). All the questions were presented on a 5-point Likert scale (1 being strongly disagree, and 5 being strongly agree).

4. Data Analysis and Results

The frequency distribution (assessed through IBM SPSS Statistics v.20) revealed the sample characteristics (N=209) that mainly comprised of respondent's specialization profile, including engineers (n=17; 8.1%), architects (n=22, 10.5%), surveyors (n=18, 8.6%), technicians (n=10, 4.8%), supervisors (n=26, 12.4%), superintendents (n=16; 7.7%), managers (n=20, 9.6%), team members (n=57, 27.3%) and others (e.g., procurement specialists; n=23, 11%). Secondly, sample characteristics also included respondents' industry experience, i.e., over 1 year to 5 years (n = 75; 35.9%), between 6-10 years (n = 111, 53.1%), and over 10 years (n = 23; 11%), respectively. In the next step, we used covariance-based structural equation modeling (CB-SEM) to empirically investigate the conceptual model of the study (Kline, 2015; Zaman et al., 2023). CB-SEM integrates multiple statistical analyses, including confirmatory factor analysis (CFA) and path coefficient analysis. As the observed variables and structural models can be simultaneously analyzed, their relations can be undermined with greater accuracy (Muthén & Muthén, 2017; Zaman et al., 2023). CB-SEM also offers the analysis, interpretation, and comparison of contrasting models in a single analysis, which assists the researchers in identifying and implementing the best models with high theoretical precision and parsimony (Kline, 2015; Muthén & Muthén, 2017). This technique was employed on the collected data by using the Mplus statistical package. Mplus offers multiple tools for statistical modeling and analysis, which are easy to use and time efficient (Muthén & Muthén, 2017). The software offers a variety of algorithms, models, and built-in programs in an easy-to-use interface. The graphical formats for displaying analysis and results help in presenting work in a better way (Muthén & Muthén, 2017; Zaman et al., 2023).

4.1. Confirmatory Factor analysis (CFA)

Confirmatory factor analysis (CFA) is SEM tool that is implemented as a measure of coherence between the indicators and the observed variables, specifically within a measurement model (Brown and Moore, 2012). CFA assesses the degree how the data matches up with the proposed measurement model. Table 1 shows the values of CFA standardized factor loading (denoted by π), composite reliability and convergent validity of all the items as well as constructs used to develop the multi-dimensional scale of this study. For the sample size of this study (N=209), standardized factor loading values greater than 0.4 are acceptable, as suggested by Hair et al. (2006), while the average threshold value is 0.5 (Awang et al., 2015). It can be noted that all the items yielded acceptable standardized loading except PA10 and PA11, which were deleted from the scale to increase its reliability and validity.

Table 1 Confirmatory Factor Analysis, Composite Reliability and Convergent Validity of Measurement Model (N=209)
(Source: Authors own work)

	π	CR	AVE
Treating Uniformly/Individualization		0.84	0.52
PL1	0.616		
PL2	0.716		
PL3	0.635		
PL4	0.837		
PL5	0.782		
Self-Centeredness/Other-Centeredness		0.85	0.53
PL6	0.692		
PL7	0.789		
PL8	0.752		
PL9	0.716		
PL10	0.692		
Decision Control/Autonomy		0.86	0.67
PL11	0.783		
PL12	0.886		
PL13	0.710		
PL14	0.729		
Enforcing Work Requirements/Flexibility		0.83	0.57
PL15	0.512		
PL16	0.803		
PL17	0.840		
PL18	0.814		
Distance/Closeness		0.91	0.73
PL19	0.872		
PL20	0.904		
PL21	0.761		
PL22	0.863		
Project Proactivity		0.84	0.52
PA1	0.690		
PA2	0.662		
PA3	0.719		
PA4	0.729		
PA5	0.784		
Project Adaptability		0.81	0.51
PA6	0.756		
PA7	0.760		
PA8	0.654		
PA9	0.686		

PA10	***		
PA11	***		
Project Resilience		0.86	0.51
PA12	0.704		
PA13	0.622		
PA14	0.556		
PA15	0.918		
Megaproject Management Success		0.87	0.57
MPS1	0.790		
MPS2	0.807		
MPS3	0.746		
MPS4	0.718		
MPS5	0.705		
Megaproject Ownership Success		0.85	0.66
MPS6	0.786		
MPS7	0.885		
MPS8	0.765		
Megaproject Investment Success		0.76	0.51
MPS9	0.745		
MPS10	0.765		
MPS11	0.631		

a: **Absolute fit indices**: x^2= 1209, df= 965, x^2/df= 1.25, P= 0.00, RMSEA= 0.035, SRMR= 0.055; **b: Comparative fit indices:** CFI= 950 TLI= 947; **Note:** π= standardized loadings CFA, CR= Composite reliability, AVE= Average variance extracted, *** items deleted due to low factor loadings

Similarly, the observed values of composite reliability (CR) for all constructs/variables exceed the suggested threshold limit of 0.7 (Carlson and Herdman, 2012), which indicates the sufficient internal consistency of the scale. Average variance extracted (AVE) values greater than 0.5, as observed in the current study, indicate the presence of convergent validity in the construct items (Mustafa et al., 2020). The existence of convergent validity reflects that those constructs within the scale are actually related to each other that are expected to be interrelated. Moreover, it can also be noted that comparative fit indices (CFI and TLI) yielded higher values (.95 and .947, respectively) which indicate a good measurement model fit for the structural equation. Similarly, the absolute fit indices (including chi-square, chi-square/degree of freedom, RMSEA and SRMR) support the measurement model as a good fit for the proposed SEM. Ratio of chi-square to the degree of freedom (x^2/df) is observed to be less than the recommended cut-off value (1.25<5), RMSEA value exists within the recommended range (0.05-0.1) and SRMR between 0-1 and less than typically recommended cut-off value (0.055<0.8). (Hu and Bentler, 1999).

4.2. Multi-collinearity and Discriminant Validity

Table 2 presents the summary of outcomes from discriminant validity and multi-collinearity tests. In the following table, the diagonal values are the measures of the square root of the variance between the observed constructs, while non-diagonal values represent the measure of the correlation between the constructs. As shown in Table 2, the values on the diagonal are greater than the values on the non-diagonal in the same column. It emphasizes the discriminant validity within the constructs (Lucas et al., 1996). This means that all the constructs that are expected

not to be related to each other are not related in practice, which also proves no multi-collinearity within the constructs.

Table 2 Multi-Collinearity and Discriminant validity (HTMT) (N=209)
(Source: Authors own work)

	Treating Uniformly/Individualization	Self-Centeredness/Other-Centeredness	Decision Control/Autonomy	Enforcing Work Requirements/Flexibility	Distance/Closeness	Project Proactivity	Project Adaptability	Project Resilience	Megaproject Management Success	Megaproject Investment Success	Megaproject Ownership Success
Treating Uniformly/Individualization	**0.72**										
Self-Centeredness/Other-Centeredness	0.549	**0.73**									
Decision Control/Autonomy	0.335	0.304	**0.78**								
Enforcing Work Requirements/Flexibility	0.409	0.537	0.310	**0.75**							
Distance/Closeness	0.342	0.432	0.209	0.406	**0.85**						
Project Proactivity	0.303	0.239	0.189	0.221	0.148	**0.72**					
Project Adaptability	0.073	0.243	0.180	0.197	0.101	0.424	**0.72**				
Project Resilience	0.216	0.241	0.181	0.248	0.158	0.428	0.352	**0.71**			
Megaproject Management Success	0.427	0.191	0.222	0.259	0.177	0.335	0.100	0.374	**0.75**		
Megaproject Investment Success	0.266	0.280	0.227	0.286	0.236	0.115	0.018	0.211	0.382	**0.81**	
Megaproject Ownership Success	0.530	0.335	0.329	0.329	0.204	0.436	0.194	0.419	0.573	0.452	**0.72**

4.3. Hypotheses Testing

Path coefficient analysis, theoretically explained by Wright (1921), was used in the present study to examine the relationships between the independent and dependent variables. Therefore, hypotheses testing of the proposed relationships between paradoxical leadership, project agility and megaproject success was evaluated in terms of path coefficients (β values). The path coefficients measured in terms of β-value were determined during CB-SEM analysis (Blunch, 2008). The path coefficients with positive values indicate a positive relationship between the variables. Thus, from the summary of hypotheses testing outcomes provided in Table 3, it can be observed that positive β-value were obtained for the relationships conceptualized under hypotheses (H_1, H_2, H_3, and H_4), indicating that; (1) PL has a significant positive effect on MPS, (2) PL has a significant positive effect on PA, (3)

PA has a significant positive effect on MPS, and lastly, (4) PA plays a mediating role in the relationship of PL and MPS.

Moreover, the relationship between paradoxical leadership and project agility under H_2 yielded the highest β-value (0.498), indicating a highly significant association. Similarly, the relationship between paradoxical leadership and megaproject success (H_1) yielded a nearly similar β-value (0.429) indicating a significant positive relationship. H_3, representing the relationship between paradoxical leadership and megaproject success, yielded a β-value of 0.446 which also shows a significant positive relationship. Moreover, H_4 exhibited a positive mediating effect of project agility on the relationship between paradoxical leadership and megaproject success (β-value=0.222). This indicates that all hypothesized relationships were positive and statistically significant (Kundi, Aboramadan & Abualigah, 2023; Zaman et al., 2022). The measurement model of the study shown in Figure 3 presents the path coefficients between paradoxical leadership, project agility, and megaproject success, as well as the association between the dimensions of these scales.

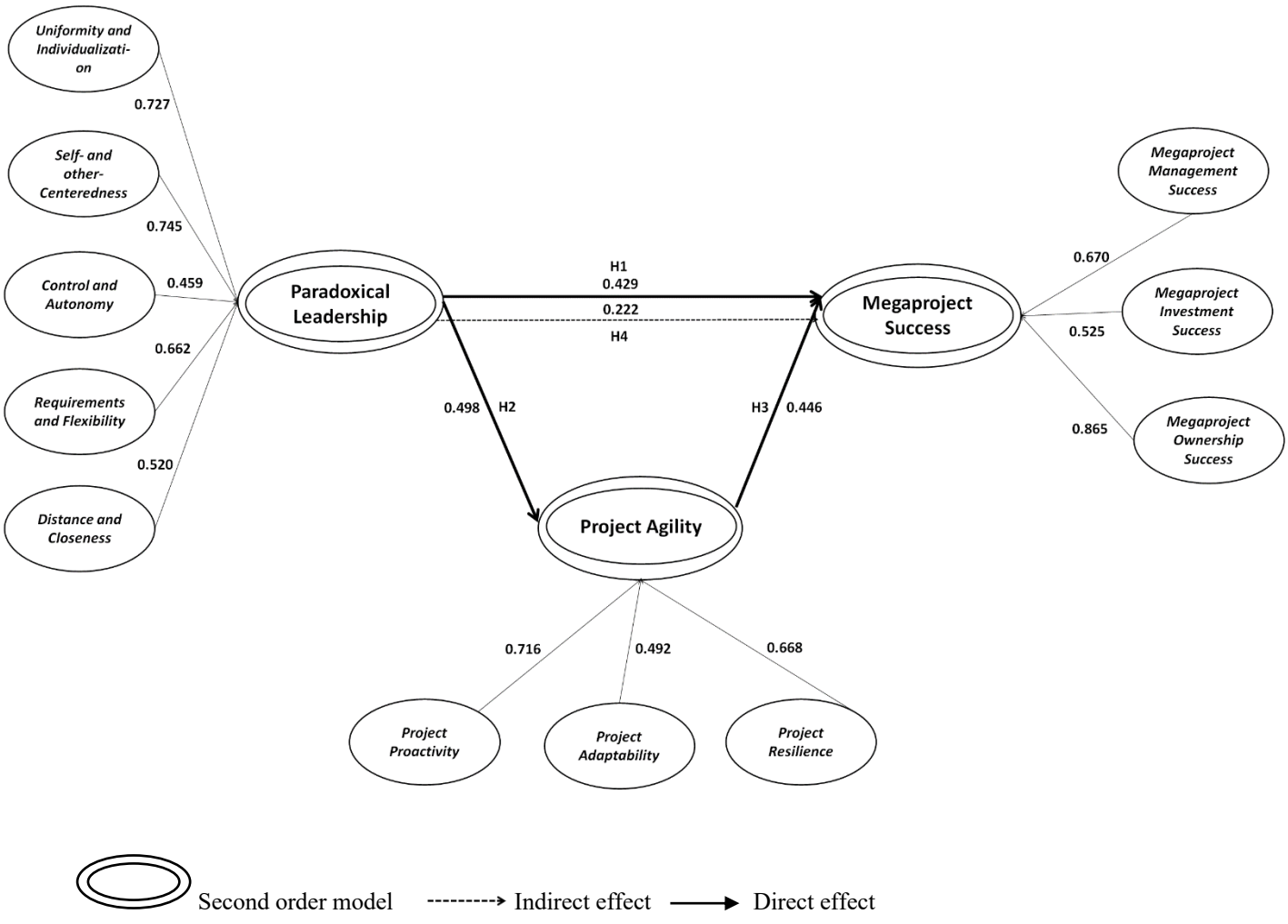

Figure 3 Structural Model of Megaproject Success

(Source: Authors own work)

Table 3 Hypotheses Testing
(Source: Authors own work)

Hypotheses	***β-values***	***p-values***	**Outcomes**
H1: Paradoxical leadership → Megaproject success	0.429	<.05	Accepted
H2: Paradoxical leadership → Project agility	0.498	<.05	Accepted
H3: Project agility → Megaproject success	0.446	<.05	Accepted
H4: Paradoxical leadership → Project agility → Megaproject success (*mediating hypothesis*)	0.222	<.05	Accepted

5. Discussion

The present study made a pioneering effort to develop and validate a conceptual model built on emerging concepts of project management, such as multidimensional project agility (including project proactivity, project adaptability and project resilience) and multidimensional megaproject success (including megaproject management success, megaproject ownership success, and megaproject investment success), linked with paradoxical leadership (Kundi, Aboramadan & Abualigah, 2023; Radhakrishnan et al., 2022; Zaman et al., 2022). The hypothesized relationships were examined and evaluated through CB-SEM with Mplus statistical software. The study findings mostly show coherence to the existing literature. Firstly, paradoxical leadership has a significant positive impact on megaproject success, which aligns with the findings of prominent studies (Herron & Garland, 2019; Hipman & Tooey, 2017). Prior studies have also emphasized that a paradoxical leadership approach can outperform centralized and fully controlled project management (Herron & Garland, 2019; Shehata et al., 2023). Similarly, the findings validated the positive impact of project agility on megaproject success which also supplements previous literature (Dingsøyr et al., 2012; Niederman et al., 2018; Radhakrishnan et al., 2022). Secondly, the present study findings revealed a significant positive effect of paradoxical leadership in fostering project agility to cope with the dynamic environment of megaproject management, including changes and alterations in plans (Ma & Fu, 2020; Mashali et al., 2023; Shehata et al., 2023). This observation is in line with conclusions drawn by Tidd and Bessant (2014). Dougherty (2001) asserted that fully decentralized and autonomous project management is more capable of dealing with highly uncertain and flexible project environments. Although this observation partially supports the findings of our study, the counter-paradoxes in our study (e.g., decision control and self-centredness) contrast with these observations (Zhang, Zhang & Law, 2022).

Thirdly, the present study findings demonstrated that project agility has a significant direct impact on the success of megaprojects in the construction industry (Zaman et al., 2022) that aligns with prior literature on agile projects

(Kanski, Budzynska & Chadam, 2023; Lee and Xia, 2005). Moreover, the findings also highlighted that project agility significantly mediates the linkage between paradoxical leadership and megaproject success. Paradoxical leadership showed a significantly positive impact on megaproject success (including megaproject management success, megaproject investment success, and megaproject ownership success) through project agility (including project proactivity, adaptability, and resilience). Hence, the present study provides pioneering evidence to highlight the multidimensional nature of project agility and its mediating effects on the relationship between paradoxical leadership and megaproject success. These findings supplement prior studies that also linked project success with the adaptability dimension of project agility (Shenhar & Holzmann, 2017). Likewise, Lewis et al. (2014) also argued that paradoxical leadership enhanced strategic agility. Similarly, Albeshr (2019) also measured the success of megaprojects from three different dimensions related to management, organization and stakeholder's perspectives that align with our multi-dimensional assessment of megaproject success (Mashali et al., 2023; Zaman et al., 2022). Lastly, the present findings establish that paradoxical leaders can increase opportunities for megaproject success by fostering agility in project teams to align their actions with project conditions, including uncertainties and challenges (Pyne, 2022; Radhakrishnan et al., 2022). By embracing paradoxical thinking in megaprojects, the leaders can manage quick adaptation using project agility and lead to breakthrough ideas and solutions for complex problems in megaprojects (Ma & Fu, 2020; Radhakrishnan et al., 2022; Salvoldi et al., 2022; Shehata et al., 2023).

5.1. Theoretical Implications

Technological advancements and innovations have also brought complexity to organizational systems (Costa, 2021; Pyne, 2022). Therefore, the need for composite and mixed management, including emerging leadership approaches, has aroused significantly (Papke-Shields et al., 2010; Salvoldi et al., 2022; Shehata et al., 2023). The present study sheds light on the theoretical background and conceptualization of paradoxical leadership in the context of megaprojects (Mashali et al., 2023; Shehata et al., 2023). Paradoxical leadership allows the creation of a balance between two contradicting options yet equally important while dealing with their demerits (Shehata et al., 2023; Zhang, Zhang & Law, 2022). The present study, both theoretically and empirically, draws a connection between paradoxical leadership, project agility, and megaproject success. The present study extended theoretical insights through the multi-dimensional assessment of project agility and megaproject success. Taking advantage and reliance on prominent theories, including: (1) theory of satisficing managerial behaviour (Simon, 2013), (2) stewardship theory of management (Davis and Donaldson, 1997), (3) theory of complex adaptive systems (Holland, 1992), (4) theory of paradox (Smith and Lewis, 2011), (5) theory of paradoxical behavior (Zhang et al.,

2015), and (5) theory of meta-paradoxical leadership (Pearce et al., 2019), the present study offered new empirical evidence in favor of these theories. Moreover, the present study identifies that paradoxical leadership poses a significant positive impact on project agility and megaproject success, while project agility mediates the relationship between paradoxical leadership and megaproject success. These theoretical developments add to the limited literature on paradoxical leadership and project agility, especially in the context of limited scholarly attention toward megaprojects (Kundi, Aboramadan & Abualigah, 2023; Mashali et al., 2023; Radhakrishnan et al., 2022; Zaman et al., 2022).

5.2. Managerial Implications

The capacity to withstand contradictions is a necessary skill for project managers (Pyne, 2022; Radhakrishnan et al., 2022). The present study's foremost managerial implication includes emphasizing the significance of adopting paradoxical leadership to balance the seemingly opposing demands (e.g., innovation and efficiency) in megaprojects. Moreover, megaproject leaders should strive to create agile project environments through paradoxical leadership to ensure flexibility and adaptability that aims to meet desired expectations of stakeholders in megaprojects (Zhang, Zhang & Law, 2022). Paradoxical leadership can positively impact all key determinants of megaproject success (i.e., megaproject management success, megaproject investment success, and megaproject ownership success) (Dougherty, 2001). Hence, investment in the training and development of project managers and their teams is essential to foster a learning culture, mitigate potential risk, balance short-term versus long-term goals, and keep projects on track by continuously monitoring and evaluating progress (Kundi, Aboramadan & Abualigah, 2023; Ma & Fu, 2020; Pyne, 2022). The present study contributes to the evaluation of paradoxical leadership, project agility and megaproject success, which has been quite less documented in empirical research (Kanski, Budzynska & Chadam, 2023; Mashali et al., 2023; Zhang, Zhang & Law, 2022).

Zhang et al. (2015) developed an encompassing five-dimensional scale of paradoxical leadership. The present study provides a practical pathway for project managers, especially in realizing the complex management dynamics of megaprojects. The present study empirically validates a significant positive effect of paradoxical leadership on project agility. It is helpful for project managers to increase the megaproject agility in all three dimensions (project proactivity, and project adaptability, and project resilience) by exercising a "both-and" management approach. Moreover, the present research also provides practical guidance to increase megaproject success (including megaproject management success, megaproject investment success, and megaproject ownership success) by harvesting agility in megaprojects. Hence, project agility can also create an indirect positive

influence of paradoxical leadership on megaproject success (Kanski, Budzynska & Chadam, 2023; Salvoldi et al., 2022; Zaman et al., 2022).

5.3. Limitations and Future Research

The present study data is limited to the volunteer participation of project officials and practitioners associated with CPEC megaproject (i.e., multibillion-dollar landmark megaproject in Pakistan sponsored by China). Hence, the current analysis focuses only on megaprojects in the construction industry. Acknowledging that dynamics of decision-making and paradoxes in project management can significantly differ due to the nature of the project, while selecting only one industry can add to the explicitly of this study. To draw generic conclusions, future studies need to investigate the association between these latent constructs (i.e., paradoxical leadership, project agility and project success) in a different frame of reference (e.g., ICT projects). Furthermore, quantitively collected data cannot apprehend any personal or additional input from the respondents. To overcome this limitation, further research can be designed as a qualitative method or mixed approach to incorporate experience-based inputs to deeply explore and understand the problem from the practitioner's perspective. By evaluating a framework that improves the agility of public as well as private construction projects, this research adds to the literature on both organizational agility and project management. It accomplishes so by demonstrating the different types of management styles (i.e., paradoxical leadership approach) that can be helpful to advance project proactivity, project adaptability, and project resilience, as well as the routes by which managers undergo this approach for megaproject success (Kuntz et al., 2016).

The use and application of paradoxical leadership may not accurately extend to the private sector. Some of the dimensions of paradoxical leadership can be more impactful in boosting project agility, which may be discovered via subsequent research. Though not specifically examined in the present research, it would be interesting to investigate the negative consequences of project leadership that rely only on one side of a behavioral contradiction (e.g., exercising control without enabling autonomy) as opposed to paradoxical leadership. Waldman and Bowen's (2016) highlighted the contradictions between leadership modesty and narcissist behavior to support this reasoning. The authors argued that both components (e.g., exercising control and enabling autonomy) are critical for successful leadership in order to counterbalance each other's beneficial and/or detrimental effects. Lastly, the present research relied on quantitative data and cross-sectional survey design with procedural remedies to overcome any issue of common method bias (Zaman et al., 2023). However, future researchers may consider collecting primary data through longitudinal studies that can better establish confidence in the cause-and-effect relationships (Aktan, Zaman & Nawaz, 2021; Zaman et al., 2023).

6. Conclusion

The present study uncovers the underlying relationships between paradoxical leadership, project agility, and megaproject success. CB-SEM analysis of survey-based data collected by CPEC mega project professionals (N=209) indicates that paradoxical leadership has a significant positive effect on project agility and megaproject success. Whereas project agility significantly mediated the relationship between paradoxical leadership and megaproject success. The present study provides initial empirical evidence in favor of hypothesized relationships based on underpinned theories (including paradox theory, program theory of change, theory of constraints, theory of satisficing demands and stewardship theory of management). The managerial and theoretical implications of the study provide conceptual and practical frameworks for emerging concepts of paradoxical leadership and project agility in the context of megaprojects. In future studies, machine learning-based methods can be used to better predict paradoxical leadership and project agility (Yan & Wang, 2022), while optimization-based approaches can be used thereafter to allocate resources, especially in megaprojects (Wang & Wu, 2021; Zaman et al., 2021).

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